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By use of
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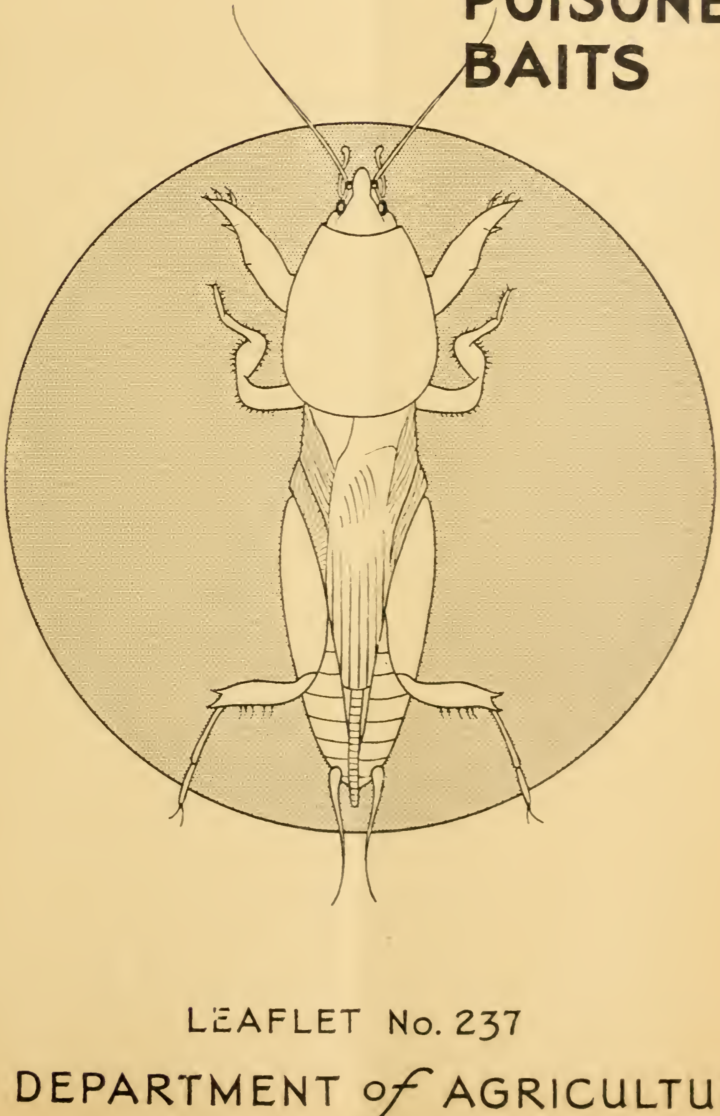

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U. S. DEPARTMENT of AGRICULTURE

CONTROL OF MOLE CRICKETS BY USE OF POISONED BAITS

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Many growers of vegetables and tobacco as well as most home gardeners in the southeastern part of the Coastal Plain are familiar with mole crickets, also known locally as "cricket moles" or "ground puppies." Outbreaks of these pests have occurred at various times and places in the South Atlantic and Gulf Coast States from North Carolina to Texas. In addition to injuring vegetables and tobacco, mole crickets often damage such crops as peanuts, strawberries, and grasses. According to estimates, the average annual losses in North Carolina, South Carolina, Georgia, Florida, Alabama, and Mississippi, where these insects are most often present in injurious numbers, aggregate nearly $2,000,000, including the damage to crops and the cost of control in seedbeds and in the fields.

What Mole Crickets Look Like

Although mole crickets belong to the same family of insects as do the common field cricket and the hearth cricket, they have only a slight resemblance to these other insects. The full-grown mole cricket (fig. 1, *A*) is about 1½ inches long and ¼ inch wide. It is light brown, the lower surface being much lighter than the upper and often slightly tinged with green. The insect's most striking features are the large, beady eyes and the short, stout front legs, which bear shovellike feet well fitted for digging.

Four Kinds of Mole Crickets

Four kinds of mole crickets are known to occur in destructive numbers in the territory mentioned previously. The most common and abundant is the southern mole cricket (*Scapteriscus acletus* R. & H.), which, in certain sections, is accompanied by the changa, or Puerto Rican mole cricket (*S. vicinus* Scudd.). These two kinds are found commonly in soils of the sandy type where vegetables are grown commercially. The short-winged mole cricket (*S. abbreviatus* Scudd.) is found only in the southern third of Florida. The northern mole cricket (*Gryllotalpa hexadactyla* Perty) is comparatively scarce except in a few localities having wet, heavy soils.

How Mole Crickets Damage Crops

Mole crickets damage crops by feeding on the roots, root stems, tubers, or fruits of the plants and also by burrowing in the upper

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inch or two of the soil (fig. 2) about the roots, causing affected plants to dry out or uprooting them. Sprouting seedlings or transplants of many crops are specially subject to injury through being fed upon or uprooted. Since one mole cricket in burrowing can cover several yards of territory in a single night, the damage done by only a few specimens per square yard sometimes completely destroys a seedbed in a few nights.

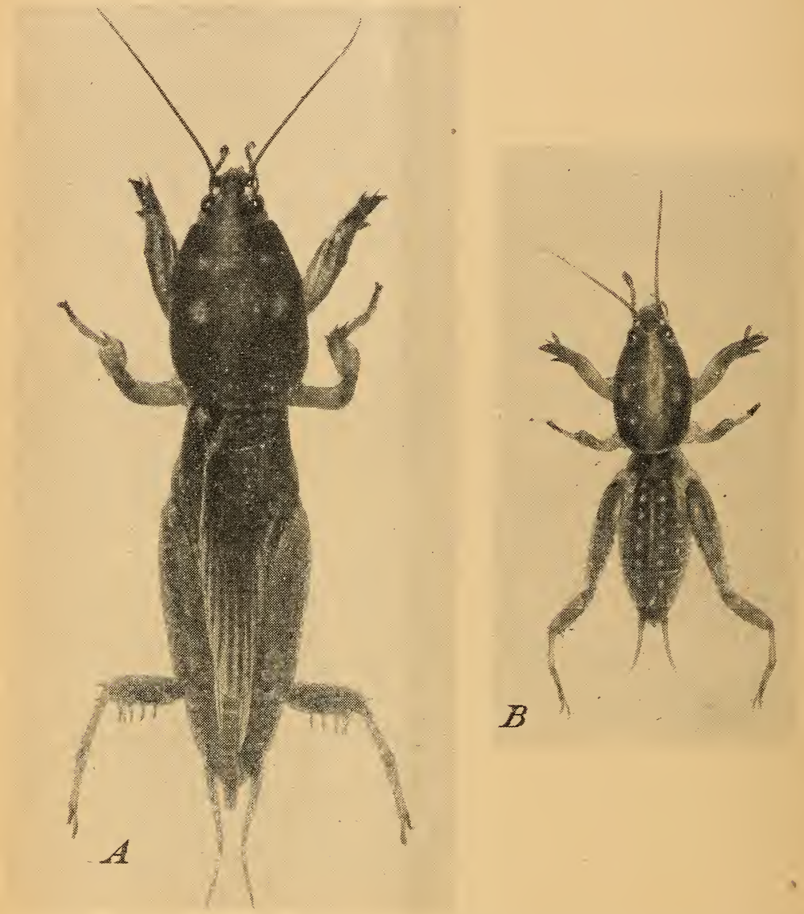

Figure 1.—*A*, Full-grown (or adult) mole cricket (*Scapteriscus* sp.); *B*, young mole cricket, or nymph. *A* about 2½ times natural size, *B* about 3 times natural size.

Mole crickets may severely damage almost any of the crops mentioned if planted in an infested field. In addition to the damage caused to the seedlings and to transplants, there is continual damage to the underground parts of such crops as turnips, potatoes, and peanuts. Ripening strawberries are a favorite food of mole crickets, and fruits of other crops are sometimes fed upon when they touch the ground. Grasses are a favorite food, and when mole crickets become established in lawns or golf courses they often cause serious damage by their feeding and burrowing.

How Mole Crickets Live

The female adult or parent mole cricket lays her eggs loosely on the bottom of cells which she constructs in the soil from 3 to 10 inches below the surface. Ordinarily about 35 eggs are laid in each cell. The southern mole cricket usually constructs and lays her eggs in 4 or 5 separate cells, whereas the changa lays hers in 3 or 4. Each cell made by these two kinds of mole crickets is closed tightly by the female to protect her eggs from being eaten by other mole crickets. The northern mole cricket usually constructs only 1 cell, lays all her eggs therein, and watches over the eggs and developing young. These 3 kinds of mole crickets, comprising those that are commonest within the badly infested area, lay most of their eggs in the spring and early summer.

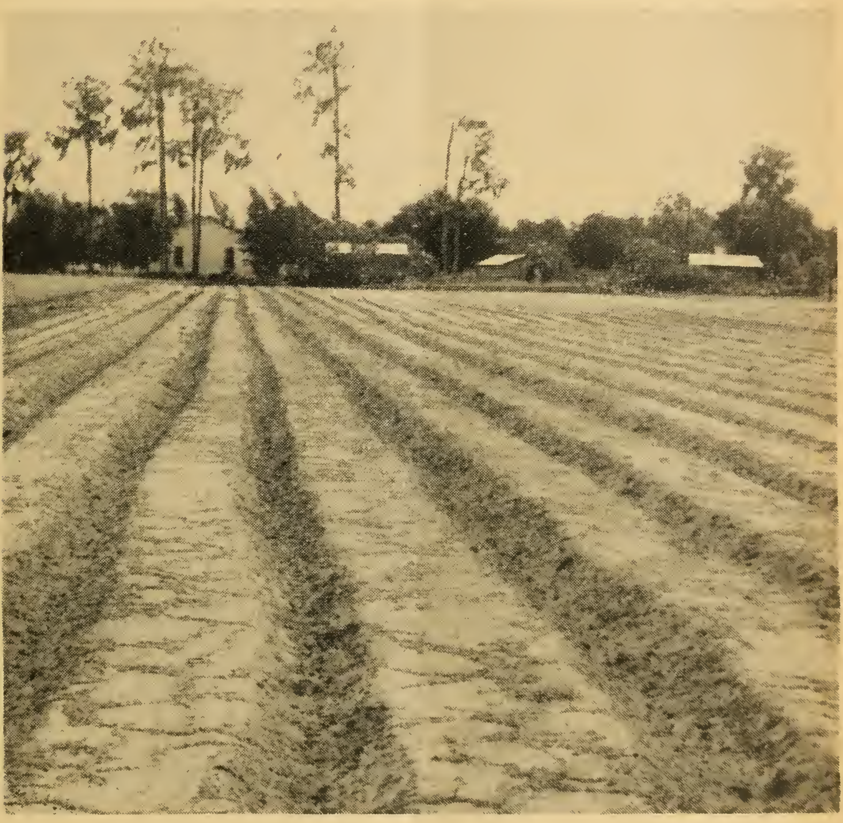

FIGURE 2.—Typical example of temporary burrows made by mole crickets at or just below the soil surface. This burrowing was done during one night, following the plowing of the field and the smoothing of the beds.

In Florida, where these mole crickets have been studied most thoroughly, the time spent in the egg ranges from 37 days for those laid in April to 10 days for those laid in July, depending on the prevailing temperature. Egg deposition and hatching are somewhat delayed in the more northern States of the heavily infested region. The young mole crickets, known as nymphs (fig. 1, *B*), are wingless. They grow rapidly in the summer and early fall, so that about 80 percent of the changa and northern mole cricket nymphs become winged adults before midwinter. The southern mole cricket develops more slowly than the other two; consequently only about 25 percent of its nymphs become full-grown by midwinter. The others, however, reach full growth before spring, and the females are ready to start laying eggs for another generation at the same time as those maturing earlier. There is only one generation a year.

Mole crickets spend most of their time in permanent burrows several inches deep in the soil. During cold weather these burrows are dug deeper, so freezing has no effect upon these insects. In periods of drought the mole crickets extend their burrows downward to a point where soil moisture is still available or they may desert unfavorable situations and burrow in the loose, moist soil in the bottom of ditches or along roadways. If the soil is flooded, the mole crickets will leave their burrows and swim about in an effort to find dry land.

Mole crickets are most active at night, particularly when the soil sheltering them has been wet by a rain or artificial watering and when the temperature is above approximately 70° F. At such times about 75 percent of the mole crickets will come to the surface to feed and will make temporary burrows in the upper inch or two of the soil. They usually make such burrows in a haphazard manner, frequently sticking the forepart of the body out of the burrow and looking around. It is on such occasions that they reach out and grab particles of food, including the poisoned bait described later in this leaflet, and quickly withdraw into the burrow to feed. There is no evidence that mole crickets are attracted to small piles of food or poisoned bait.

Although mole crickets frequently leave their burrows, even when living conditions are favorable, and make short excursions over the soil surface, they feed very little at such times.

Keeping Down Mole Crickets With Poisoned Bait

Since mole crickets feed largely on the soil surface at night, they can be controlled by the proper use of poisoned baits. The most effective time for baiting is during August and September when the nymphs are growing fast and require much food.

To prepare the poisoned bait use the following formula:

Wheat bran (dry)	100 pounds.
Sodium fluosilicate	8 pounds.
Water to moisten	3 to 5 gallons.

Thoroughly mix the poison and dry wheat bran. (Mill-run bran is preferable, because it contains a higher content of free flour.) Every particle of bran must be well covered with poison. Add only enough water to the dry bran and poison to cause the bait to form a ball of loose texture when squeezed in the hand and to break up readily into a crumbly mash when held in the open palm. A wet, sloppy bait is effective, but a much better distribution is obtained when the bait is sufficiently "flaky" to scatter evenly.

Since moistened bran tends to mold and spoil, mix only enough bait for a single application at one time.

Corn meal, rice flour, oatmeal, or wheat flour can be substituted for the wheat bran in the poisoned bait, but these materials are less satisfactory. Sirups do not increase the attractiveness of wheat bran and are not recommended. Stable manure, tankage, dried blood, and meat scraps, although attractive to mole crickets, do not increase the effectiveness of the wheat-bran baits.

Arsenic-containing materials, such as paris green, lead arsenate, or calcium arsenate, are effective in poisoned baits for the changa but are of little value against the southern mole cricket and the short-winged mole cricket. Sodium fluosilicate is the only poison tested thus far that has proved satisfactory against all three kinds.

Scatter the bait evenly and thinly on the soil surface of infested premises—if possible, so evenly that a few flakes will fall on every square inch of soil in the treated area and be within easy reach of any mole cricket that might come to the surface. Under ordinary conditions 20 pounds of the dry poisoned-bait material (weight before moistening) is sufficient for one application on 1 acre.

A single application of poisoned bait will kill only about three-fourths of the mole crickets in any given area, since they do not all feed at the same time and mole crickets may move into a treated area from a nearby untreated area. Therefore a second application may be needed, and sometimes a third and perhaps a fourth, at about 10-day intervals or whenever the soil surface is sufficiently moist to encourage the mole crickets to feed.

To lessen reinfestation from untreated to treated areas, scatter the poisoned bait on adjacent roadways, ditch banks, and idle fields for a distance of several yards around treated fields. It is recommended that as large an area as possible be baited at one time when conditions of temperature and soil-surface moisture are favorable.

Bait applied immediately after plowing or disking is fairly effective—much more so than when scattered on the soil and plowed under. Better results are obtained by applying the bait to bare fields than to fields covered with a heavy growth of weeds or grass. The best results can be expected when recently plowed fields are baited after a good rain or irrigation.

Precautions

In handling, mixing, and applying poisonous insecticides, such as sodium fluosilicate or arsenical compounds, take special care not to inhale excessive quantities at any time. Well-designed respirators that afford protection to the entire face are available and should be used when such danger exists. After working with insecticides, wash the hands or any exposed parts of the body thoroughly.

Containers in which these materials are stored should be plainly labeled and placed under lock and key, or at least out of the reach of irresponsible persons or children and of livestock. Any unused portions of these poison preparations should be treated likewise, as well as the receptacles in which they have been mixed. The containers in which the bait has been mixed should be thoroughly washed

out and the poisonous waste water poured into a hole dug in the soil, and covered.

Experience and careful observation have shown that if the poisoned bait mentioned herein is prepared and applied according to directions, its use will not be hazardous to domestic animals, poultry, or wildlife.

Supplementary Control Measures

Since a small population of mole crickets can cause serious injury to a plant bed during the time the seeds are germinating and the plants are developing, it is specially important to treat such areas thoroughly with the poisoned bait before planting. The use of barriers will prevent many mole crickets from moving from untreated areas into the treated areas. Such barriers may consist of wooden boards or other available material, approximately 12 inches wide, set 10 inches deep in the soil and extending at least 2 inches above the soil surface. Barriers should completely enclose the area to be protected, special care being taken to provide tight-fitting joints and corners.

The use of barriers should be most effective in early spring and again in the late summer and early fall, when the winged adults are least numerous. Several days before the seeds are planted, the ground inside the barrier should be treated with the poisoned bait at the rate of three-fourths of a pound per 1,000 square feet. Several subsequent applications should be made at the rate of half a pound per 1,000 square feet. All applications should be made after rains or thorough irrigations.

As sodium fluosilicate will injure tender vegetation, care should be taken to prevent the bait from touching the young seedlings if applications are made after the seeds have sprouted.

The fact that most of the mole crickets lay their eggs during the spring and early summer indicates that deep plowing at approximately 10-day intervals during this period should destroy most of the eggs or young mole crickets in areas so treated. This possible aid to mole cricket control has not been fully worked out, but warrants trial by farmers where cultural conditions permit.

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